

# A NEW RACE OF *TISIPHONE ABEONA* DONOVAN (LEPIDOPTERA RHOPALOCERA) FROM SOUTH AUSTRALIA

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## Plate xix.

THE Satyrid *Tisiphone abeona* Don. 1805 illustrates more than most Australian butterflies the interesting phenomenon of the formation of a whole series of geographical races within the limits of a continental area. Waterhouse (1922, 1923, 1928) demonstrated by genetic studies and by hybridization experiments, that several forms of this butterfly, once thought to belong to more than one species, were all races of a single polytypic species. Each of the races is geographically isolated from the next by a wide or narrow zone of country outside the *oekmene* of the species. Such isolating areas are notable either for the unsuitability of the climate, the absence of native sword grasses (*Gahnia psittacorum*, *G. aspera* and *G. microstachya*), the characteristic foodplants of the butterfly, or for unsuitable climate combined with lack of foodplants.

Hitherto known races are:

*Tisiphone abeona raawnsleyi* Miskin, 1876. South Queensland at Maroochy, Mooloolah and Caloundra.

*Tisiphone abeona morrissi* Waterhouse, 1914. North-eastern New South Wales between the Macleay and Tweed Rivers.

*Tisiphone abeona regalis* Waterhouse, 1928. New South Wales, at Barrington Tops and the Dorrigo Plateau at elevations up to 4,000 feet.

*Tisiphone abeona joanna* (Butler, 1866). New South Wales, within a radius of approximately 15 miles of Port Macquarie.

*Tisiphone abeona aurelia* Waterhouse, 1915. New South Wales, between Port Stephens and Camden Haven.

*Tisiphone abeona abeona* (Donovan, 1805). New South Wales coastal districts at Newcastle, Ourimbah, Sydney and Illawarra; also in the Blue Mountains.

*Tisiphone abeona albifascia* Waterhouse, 1904. South-eastern New South Wales from Narooma to Wilson Promontory, and eastern Victoria at Ferntree Gully, Wandin, Healesville, Mt. Macedon and Lorne.

There is one other *Tisiphone*, *T. helena* Olliff, 1888, which lives in the Cairns district of north Queensland at altitudes about 1,200 feet, on Mt. Bellenden-Ker, and at Herberton and Karunda. *T. helena*, although generally listed as a separate species, seems to belong to the polytypic *T. abeona*.

The races of *T. abeona* differ from each other in various degrees, a gradient between the forms being such as to bear a rather direct relationship with the widths of the gaps between their respective areas of distribution. *T. a. helena* being separated by nearly 600 miles from its neighbour, *T. a. rawnsleyi*, is also one of the most distinctive of the forms. *T. a. rawnsleyi* and *T. a. morrissi* also are different in appearance and are very stable forms, occupying separate areas. *T. a. rawnsleyi* is melanic, *T. a. morrissi* the most albinic of the races. South of the area occupied by *T. a. morrissi* is *T. a. joanna*. This is most unstable as to wing pattern, no two examples being taken which are exactly alike. Waterhouse has shown the great probability that *T. a. joanna* arose as a natural hybrid during recolonization of the Port Macquarie district by elements of two formerly separated subspecies, *T. a. morrissi* and *T. a. aurelia*. He supported his deductions by a series of hybridization experiments, and in the  $F_2$ -generation of *morrissi* x *aurelia* crosses, reproduced the highly variable complex of forms typical of the natural *T. joanna* population.

Three southern races, *T. a. aurelia*, *T. a. abeona* and *T. a. albifascia*, are rather similar as to markings; their areas of distribution are close together and the transition from one race to the next is less clear cut than in more northern races. In the extreme south-east of the continent *T. a. albifascia* occurs, chiefly along the coast from Narooma to Wilson Promontory and extending westwards in pockets of favourable country as far as Mt. Macedon, Ferntree Gully and Lorne. The race is two-brooded, with a spring brood emerging in November and early December and an autumn one during February and March.

During a recent holiday visit to the south-east of South Australia it was of some interest to find a new race of *Tisiphone abeona*, allied to both *T. a. albifascia* and *T. a. abeona*, flying in a relatively restricted area of about two square miles within the limits of the volcanic crater lake basin, known as Lake Edward. This locality is over 200 miles west of the previously known western limit for the species, at Lorne, Victoria. Further collecting revealed the presence of the same form at Dartmoor on the Glenelg River, just over the border in western Victoria, but still leaving a belt of country over 175 miles in width in which apparently it does not occur. Since this paper was prepared Dr. A. V. Southcott has given me a specimen from the Grampians.

A formal description of the new race is as follows:

*TISIPHONE ABEONA ANTONI* subsp. nov.

Male. Wings above black; forewings with two blue-pupilled black eyespots each with a tiny white central dot; a broad orange band across midwing and a narrower one near apex; the latter is distinctly wider and cream coloured near

the costal margin; hindwings with a large eyespot near hinder angle, this is ringed with dull orange brown and black; traces of an eyespot near apex; wings below with markings arranged as above; forewings with midwing band orange in lower half, cream-toned in cell; band near apex cream-coloured, traces of two white lines parallel to outer margin; hind wing black with two large eyespots, each ringed with orange brown, that near apex with traces of a small second one below it; a broad cream-coloured band across midwing and two narrower ones near outer margin. Expanse 66 mm.

Female. Generally larger, wings more ample, markings similar but paler; midwing band of forewing tends to a cream-tone in cell; the hind wing above bears traces of a dusky cream band across the wing in the position of the broad white fascia beneath. Expanse 75 mm.

*Loc.* South Australia: *Lake Edward* (Holotype a male, and allotype female numbered I 18,951 in South Australian Museum), caught 3rd–4th January, 1947, by N. B. and A. J. Tindale. Victoria: Dartmoor, 10th January, 1947, N. B. Tindale. Mackenzie Creek, Grampians, 26th December, 1931, A. V. Southcott. 4 Males, 3 females.

The type and allotype of *T. a. antoni* are deposited in the South Australian Museum, together with three paratypes; one paratype each has been passed to the Australian Museum, Sydney, and the National Museum, Melbourne.

At Lake Edward the butterflies were rather rare and fast flying, frequenting the clumps of giant *Gahnia* grass which grow on the somewhat treacherous surface of peat bog fringing the lake on its southern side and western shores. Two days assiduous collecting yielded only four specimens, although many times that number were seen. The season of emergence was evidently well advanced and most examples seen were ragged or had suffered from symmetrical wing injuries, apparently as a result of the attacks of birds.

At Dartmoor, on 10th January, 1947, the butterflies were found, flying about clumps of giant *Gahnia* growing among teatree (*Melaleuca*) about the sources of several springs which originate in the base of the *Ostrea bed* (of probable Pleistocene age), and flow down by small lateral valleys to the main stream of the Glenelg River. The season for the species was well advanced and most of the examples were ragged. A half-day's collecting yielded only two specimens.

This race, in keeping with its greater apparent isolation, seems to differ a little more from *T. a. abeona* and *T. a. albifascia* than those two races differ from each other. This is, perhaps, to be expected, since the ranges of the latter tend now to a slight overlap in the vicinity of Narooma. Recent gene exchange may have occurred between the two forms along the meeting ground, as has clearly happened in the case of the race *T. a. joanna*.

A conspicuous difference between *T. a. antoni* and *T. a. abeona* in the male is seen in the cream colour of the costal portion of the subapical spot; *T. a. albifascia* shows this to a degree. In the female the cream colour of that part of the median band lying within the cell is highly distinctive. The median white band of the hindwing beneath, in both sexes, is as conspicuous as in *T. a. albifascia* and the inner of the two submarginal ones is even more developed. The orange-brown colour of the eyespots tends to be like *T. a. aurelia*; the brown-ringed spots in both sexes are relatively smaller than in *T. a. albifascia* and more like those of *T. u. abeona*. The size difference is particularly noticeable in the case of the subapical spot of the hindwing beneath.

### THEORETICAL DISCUSSION.

Some pertinent deductions are possible from a study of the distribution of the races of *Tisiphone*, significant because they point up, firstly the influences of changing climate, and secondly the operation of the age and area effect, whereby the most primitive and distinctive form of this polytypic species complex, namely, *T. a. helena* occurs on the isolated northern periphery of the area of distribution while the least distinctive races and latest developed ones occur near the focus about southern New South Wales. It is evident that the distribution of *Tisiphone* is controlled by relatively critical moisture and temperature limits. Its tolerances are such that while it lives near sea level on Wilson Promontory near the southern limit of its distribution, as one goes north it finds its climatic equivalent at some elevation, on mountains. Thus it occurs on Barrington Tops in New South Wales, and still further north only on the plateau of the Atherton Tableland, where it can find a temperature range and humidity suitable for it, only at elevations above 1,000 feet.

The distribution of the species is one which seems likely to have been susceptible to alteration by changes of climate, such as everywhere have characterized the Pleistocene and Recent Periods. Periods of increasing cold in Southern Australia would have tended to drive the species north, away from areas of extreme cold. It does not occur in Tasmania now, although present conditions would probably favour its living there were it to become established. Since Tasmania is postulated to be in a stage of recovery from a period of extreme cold (glaciation of Würm III), it would appear possible that *Tisiphone* was once driven out and has not yet had time to recolonize an area where its foodplant exists at the present time.

The immediate past history of Australia has apparently been one of increasing warmth. In the more southern parts this change first took the form of an amelioration of a cold wet climate which may now be passing over into a drier

and less favourable phase. As a result of this progressive change, *Tisiphone abeona* was first able to colonize a broad area from eastern Victoria to South Australia, and then with the onset of a decline in these favourable conditions, the southern colony of *Tisiphone* became divided. This division took place a sufficiently long time ago to have permitted the development of recognizable differences of apparent subspecific status. In view of the relatively brief period likely to be involved (only portion of time between Würm III and the present at a maximum), it is suggested that *T. a. abeona* may be a relatively unstable or rapidly mutating form, as well as one very sensitive to climatic changes.

The South East of this State, wet and humid though it seems by South Australian standards, might have been considered generally too inhospitable a locality for a member of such a sensitive genus as *Tisiphone*. The area within the crater or subsidence area about Lake Edward appears to constitute a relict niche which has preserved traces of a "wet" flora and fauna once more widely spread in the South East. The very presence of this butterfly is an argument in support of an immediately prior period of high humidity rather than a drier one. In fact, if dry conditions had been present, it is likely the species would have become extinct. The race also occurs on the Glenelg River at Dartmoor, where similar conditions of moisture and relatively high humidity occur in pockets within the meandering valley.

#### REFERENCES CITED.

- Waterhouse, G. A. and Lyell, G. (1914) : Butterflies of Australia, Sydney.  
Waterhouse, G. A. (1922) : *Proc. Linn. Soc. N.S.W.*, Sydney, 47, pp. 9-17, pl. i-iii.  
Waterhouse, G. A. (1923) : *Proc. Linn. Soc. N.S.W.*, Sydney, 48, pp. 13-16, pl. i-ii.

## EXPLANATION OF PLATE.

## Plate xix.

- Fig. 1. *Tisiphone abeona abeona* Donovan, male, Sydney, September, upper side.  
Fig. 2. *Tisiphone abeona abeona* Donovan, male, Sydney, September, under side.  
Fig. 3. *Tisiphone abeona abeona* Donovan, female, Waverley, October, upper side.  
Fig. 4. *Tisiphone abeona abeona* Donovan, female, Waverley, October, under side.  
Fig. 5. *Tisiphone abeona antoni* Tindale, holotype male, Lake Edward, January, upper side.  
Fig. 6. *Tisiphone abeona antoni* Tindale, holotype male, Lake Edward, January, under side.  
Fig. 7. *Tisiphone abeona antoni* Tindale, allotype female, Lake Edward, January, upper side.  
Fig. 8. *Tisiphone abeona antoni* Tindale, allotype female, Lake Edward, January, under side.  
Fig. 9. *Tisiphone abeona albifascia* Waterhouse, male, Emerald, November, upper side.  
Fig. 10. *Tisiphone abeona albifascia* Waterhouse, male, Emerald, November, under side.  
Fig. 11. *Tisiphone abeona albifascia* Waterhouse, female, Emerald, November, upper side.  
Fig. 12. *Tisiphone abeona albifascia* Waterhouse, female, Emerald, November, under side.